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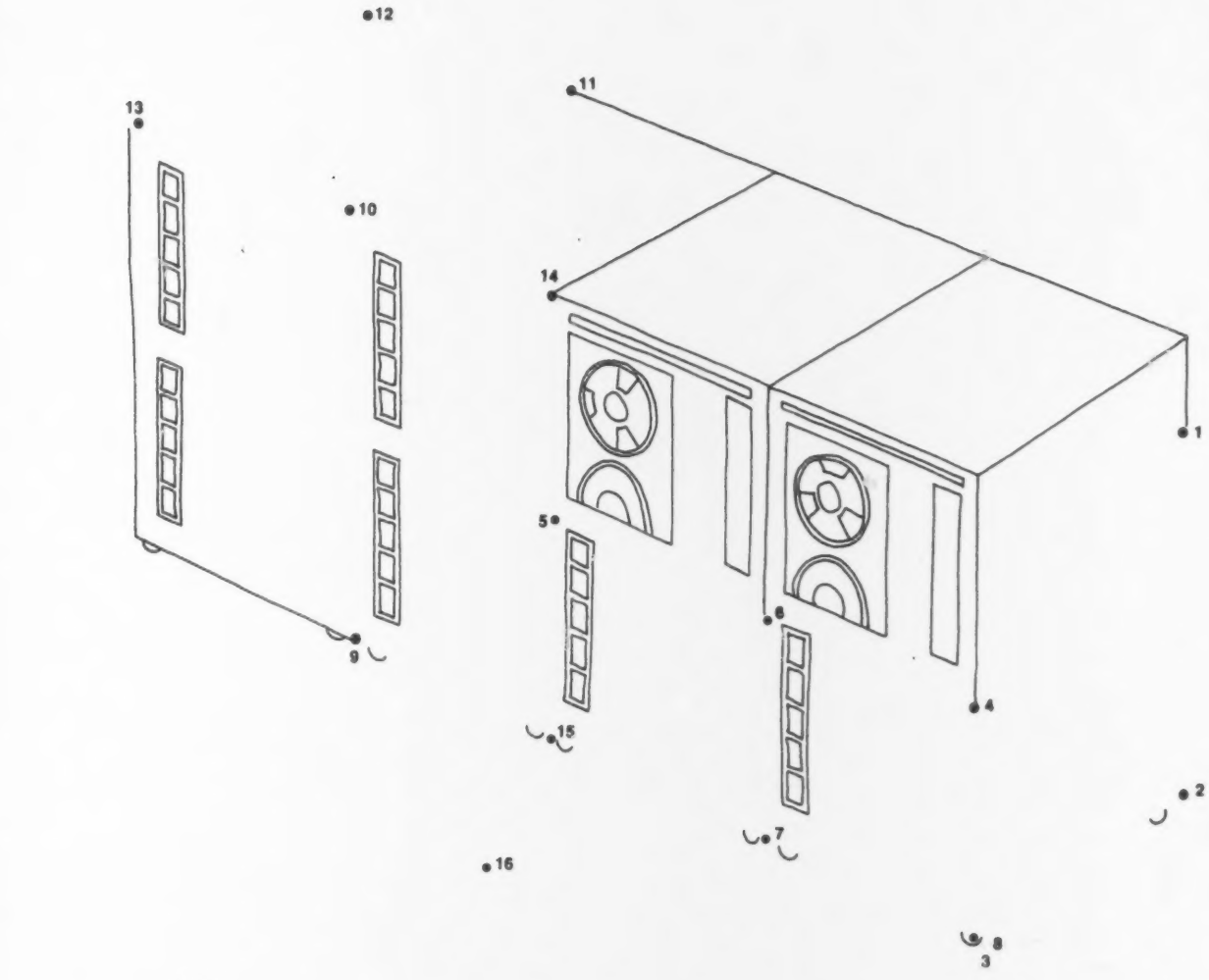

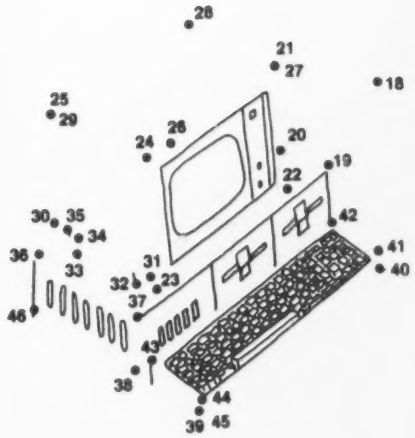

THE MICRO-MAINFRAME CONNECTION

ALSO

ANNUAL MINI-MICRO SURVEY
HOW HIGH CAN PORTABLES FLY?
EXPERT SYSTEMS IN BUSINESS
THE PROMISE OF PROTOTYPING

DATAMATION®

NOVEMBER 1983/$4.00 U.S.A.
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COVER DRAWING BY SUSAN HUNT YULE

IN FOCUS

MINIS LOSE OUT TO PCS

The personal computer is coming on strong, taking away market growth from the traditional minicomputer.

by John W. Verity

As the trend toward centralized purchasing of personal computers strengthens, IBM is capturing more than half of all users entering the corporate personal computer marketplace, according to a major survey of DATAMATION readers.

The personal computer has brought about profound changes in the small-systems marketplace, causing users to alter their spending plans and prompting new strategies in distributed processing and other techniques. Sales of traditional 16-bit minicomputers have been most affected and vendors have had to rely on the hotly contested 32-bit market for most of their near-term growth, according to the survey.

Taken in conjunction with Cowen & Co., a Boston investment research company, the 1983-84 Mini/Microcomputer Survey tallies the responses from 7,012 users of small systems, detailing their purchases prior to August 16 and the purchases they planned to make in the following 18 months.

After eliminating duplicated and invalid responses, a total of 7,012 responses were tabulated and evaluated. For the survey's purpose, the term "minicomputer" encompasses cpus ranging from the Digital Equipment PDP-8 and Data General Nova 4 through the DEC VAX-11/780 and IBM System/36. It should be noted that this survey does not take into account IBM's introduction of aggressively priced 4300 models in September.

FIG. 1

TOP 10 MINICOMPUTER SYSTEMS 1983/84

A. Based on number of respondents acquiring systems (7/83-12/84)

MANUFACTURER	SYSTEM	HOW MANY SITES ACQUIRING	AVG. UNITS/ SITE
DEC	VAX-11/780	247	1.7
IBM	System/36	195	2.1
DEC	VAX-11/750	195	1.5
DEC	VAX-Unspecified	81	3.6
IBM	Series/1	80	12.0
HP	3000-Unspecified	73	2.6
IBM	System/38	70	1.5
DEC	PDP-11/44	69	2.5
DEC	PDP-11/23	66	5.2
DEC	VAX-11/730	64	1.9

B. Based on number of units being acquired (7/83-12/84)

MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE ($ MILLIONS)
IBM	Series/1	961	41.2
Microdata	Reality 4000	540	13.5
DEC	VAX-11/780	426	132.2
IBM	System/36	417	31.7
DEC	PDP-11/23	345	8.0
DEC	VAX-11/750	296	43.4
DEC	VAX-Unspecified	294	53.6
DEC	PDP-11 Unspecified	272	28.6
HP	3000 Other/Unspecified	193	28.9
Microdata	Reality 2000	180	7.2

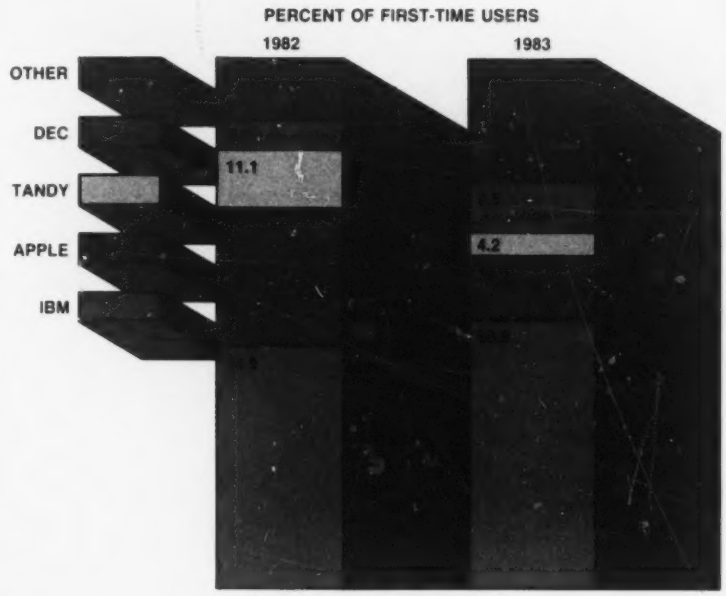
The respondents also plan to acquire:

- 173 PDP-11/44's for $9.1 million
- 48 DG MV/10000's for $14.0 million and 60 MV/4000's for $7.4 million
- 146 IBM 8100's for $20.4 million and 108 System/38's for $26.7 million
- 167 Burroughs B20's for $2.3 million
- 83 Prime 2250's for $6.3 million and 7 9950's for $2.9 million
- 33 Western Electric 3B20S's for $7.4 million and 21 3B5's for $1.4 million

In total, 2,629 respondents reported plans to acquire 13,325 systems valued at roughly $1.2 billion between 7/83 and 7/84.

FIG. 2

IBM NOW CAPTURING OVER HALF OF ALL NEW CORPORATE PC USERS

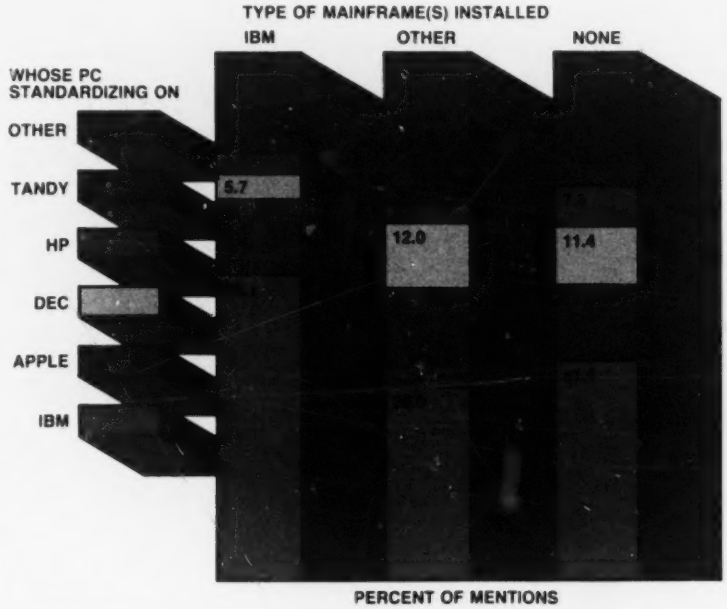


Rapid growth in this percentage indicated for DEC also, and for "Other" supplier category

FIG. 3

IBM MAINFRAME STRENGTH AIDS PC GROWTH

Query: If your organization has standardized (or is likely to soon) on just one or two personal computers, whose?



CHARTS BY PAUL GOODFRIEND

Particular attention was given in this year's survey to the personal computer, leading to the following observations:

- Pioneers in the market, such as Apple Computer and Tandy, have lost and will continue to lose market share to IBM.
- Software availability is far and away the most important criterion for selection of personal computers by corporate users.
- A handful of software packages offering a rather narrow range of functions accounts for 70% of personal computer applications.
- Among end users surveyed, as opposed to oems and systems houses, more sites will buy personal computers than minicomputers.

This year's survey indicates that the peak rate of new personal computer user growth has passed. Last year, the first full year of IBM P.C. shipments, saw a 130.4% yearly growth rate in the personal computer user base, compared to this year's rate of 86.1%.

This, however, is only one sign of IBM's dominance in the corporate purchasing of personal machines. The compound growth rate of installed user population for Apple and Tandy sites dropped dramatically in this year's figures. While last year its survey base grew 69% compounded over three years, Apple's rate this year was only 30%. Similarly, last year Tandy showed a rate of 64%, which plummeted to 27% this year.

Indeed, the survey indicates that IBM is currently capturing over half (50.9%) of all new users entering the corporate personal computer marketplace. This compares with Apple's figure of 12%, Tandy's

IBM's dominance of the personal computer industry is clear in virtually every measurement.

4.2%, and DEC's 9.5%. For DEC, the question arises as to how many of its personal computer installations are new sites and how many are replacements for installed minicomputers.

Banking, insurance, and education SIC sites showed particularly strong use of the IBM personal machine. However, the machine is apparently finding use in many other sectors, including manufacturing, communications/utilities, and government. The corporate market for personal computers is far from saturated, and it appears that second-round purchases by corporations are generally larger than first rounds.

Virtually all vendors of personal computers—24 different suppliers are tabulated—find their machine in use as office systems and standalone business systems. Commodore was the major exception, finding a stronger use in education.

Software availability is still the most important criterion among respondents for choosing personal computer hard-

ware, according to 63.8% of the survey's respondents. Following it are compatibility (48.1%), price (41.6%), and product reputation (41.1%). Where last year's survey indicated a 53% measure for price, this year's results suggest users are now choosing machines more by function than by raw pricing. The vendors whose users indicated price as the leading factor in vendor selection were Altos, Atari, Commodore, Kaypro, Osborne, Televideo, Texas Instruments, and Victor Technologies.

Product reputation and software availability are the IBM personal computer's major strengths, garnering 50% and 67%, respectively, of the mentions among respondents. The product is also the machine of choice at larger organizations, beating out Apple and DEC by a wide margin.

Large volume purchases of personal computers are more likely to be made centrally than locally, particularly by users of Wang, IBM, and DEC machines.

However, DEC and HP personal computers are more likely to be acquired directly from the manufacturer. While 68% of IBM sites and 74% of Apple sites purchased systems from independent stores, 58% of DEC sites and 64% of HP sites deal with the vendor directly. This indicates that shelf space in retail stores is still vitally important to sales of personal computers and that despite its best efforts to organize a national accounts program, Apple is still heavily dependent upon local shops.

Just under a third of all respondents in this year's survey said their organizations have standardized (or will do so soon) on one or two PC vendors. For companies with revenues of over $50 million, however, about 46% have standardized.

Of those selecting an approved vendor, 48% have chosen IBM, compared to 15% for Apple, and 8% for DEC. HP follows with 5%, while Tandy scored 4%, IBM-compatibles scored 3%, and Wang came in with 2%.

An organization's choice of mainframe vendor also seems to be a strong factor in the choice of personal computers. For instance, among IBM mainframe sites, 58.1% opted to standardize on IBM's personal computer. That number drops to 36% where other mainframes are installed and 41.4% where no mainframe is present. Apple's standing as the PC standard among IBM mainframe sites is 14.2%.

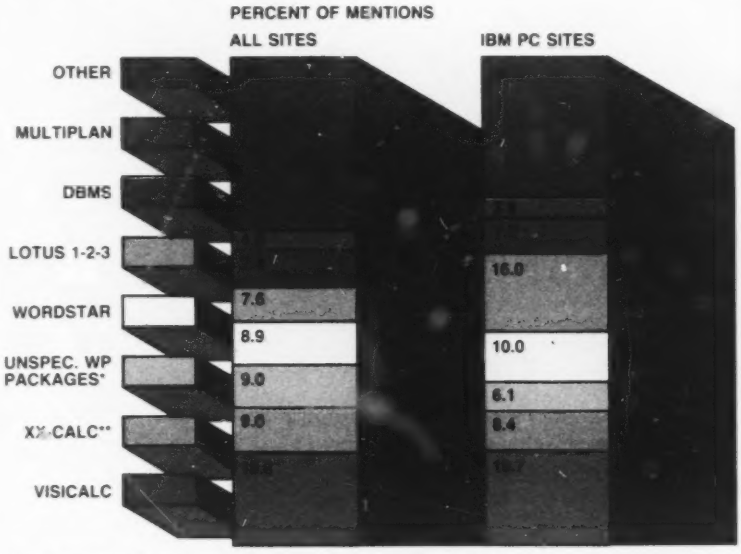
IBM's share of installed personal computer sites is up to 35.4% this year, compared with 13.1% last year, contrasting with Apple's current share of 23.6% down from 39% last year and Tandy's plummet to 9.3% this year from 17.5% last year. DEC has a 5.7% share this year, up from 1.7% a year ago.

In fact, IBM and, less so, DEC are putting the squeeze on other personal computer suppliers. Among those sites planning to purchase personal machines in the com-

FIG. 4

MOST POPULAR MICRO SOFTWARE PACKAGES

Query: Regarding your organization's personal computer software usage, what are your two primarily employed (already installed) applications software packages?

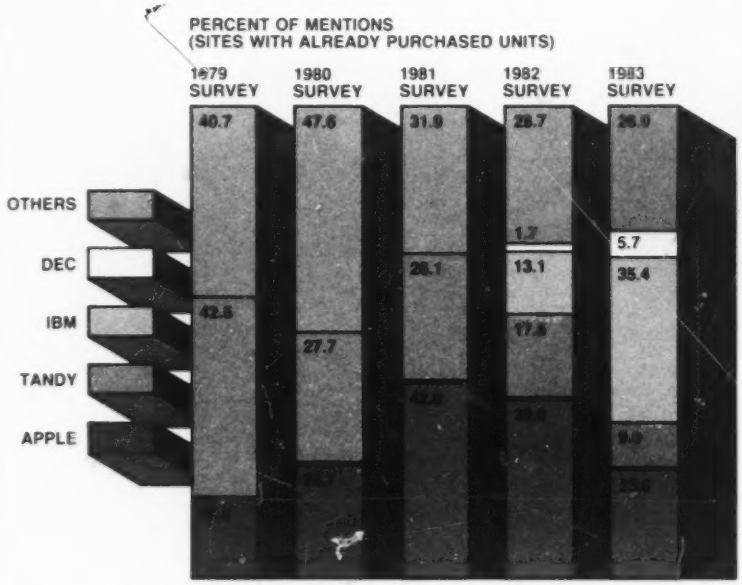


*Excludes Scripsit (1.1% of All Sites mentions), Easywriter (1.1%), etc.

**Includes SuperCalc (3.8% of All Sites mentions)

FIG. 5

IBM'S LEAD IN PCs INSTALLED



After consistent previous rise and leveling off in 1982 (the first full year of IBM PC deliveries), 1983 survey shows Apple share downshifting to state of decline.

"Others" includes HP (5.0%, down from 6.3% in 1982), Commodore 2.1%, Osborne 1.9%, Zenith 1.2%, Kaypro 1.0%, Victor 1.0%, TI 1.0%, etc. (the rest all less than 1.0%)

ing year, 51% have chosen IBM and 8% DEC. These numbers are up from 24% and 6% portions of planned purchases last year, respectively. Apple's share shrank from 28% last year to 13% this year.

It appears that DEC has made little headway with its personal computers outside of its own minicomputer user base. This contrasts with IBM's astounding dominance among Data General sites (where it has been chosen by 50% of respondents), HP (34.6%), and Wang (40.4%). So far, Hewlett-Packard is also largely confined to its own minicomputer base.

Of DEC minicomputer sites, the company has 26.6% planning to buy its personal computers in the coming year, just down from the 28.3% who did so in the last 18 months. Among those same sites, IBM had a 15.5% share in the past 18 months and a 41.2% in the coming 18 months. In contrast, 52.9% of current IBM minicomputer sites had installed IBM's personal computer in 1982-83, while a whopping 82.3% plan to install the IBM personal machines in the coming year and a half.

The survey data were inauspicious for Apple Computer's Lisa workstation, which was introduced last January after much industry speculation. Only 4% of the total Apple purchases planned through 1984 are for Lisa systems. Planned purchases of DEC personal computers break down as follows: 37% Rainbow, 30% DECmate, and 33% Professional.

Growth in spending for software is outpacing that for personal hardware. In the last 12 months, the split between software and hardware was 16.4% soft and 83.6% hard. In the coming months respondents indicated their purchases would be 20.7% soft and 79.3% hard.

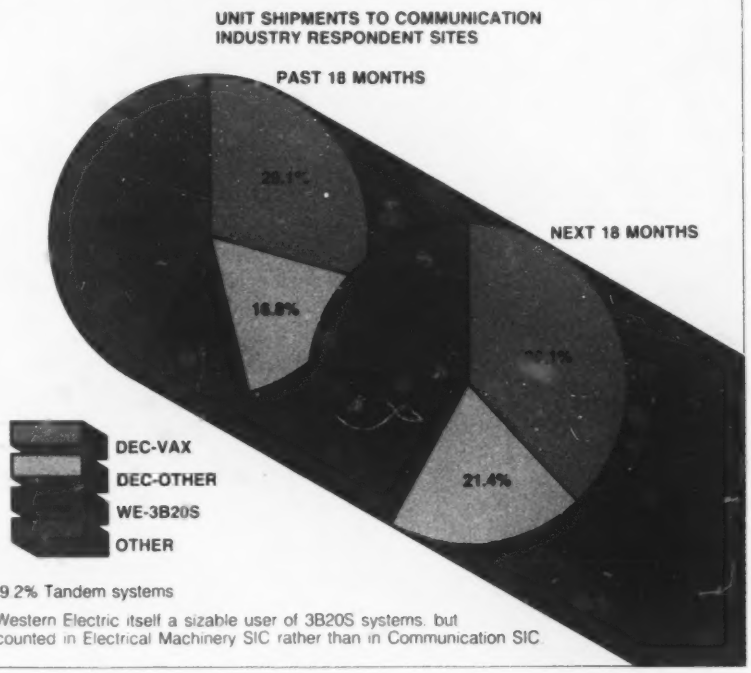
A handful of popular software packages account for about 70% of applications on respondents' personal computers. The leader remains VisiCalc, followed by Lotus 1-2-3, Wordstar, other "Calcs," and database packages. This finding leaves unanswered the question of whether any dramatically new software for personal computers other than what is currently available will be found. It also raises the possibility of vendors beginning to bundle their machines with software, according to Cowen analysts.

As for the minicomputer market, survey data project an upturn in overall sales in the coming year, but market growth will be far from the rates enjoyed when the industry emerged from the recession of 1974–75.

In terms of year-to-year expansion, this year's survey indicates only 7% growth in the domestic minicomputer-user population. This number supports the observation that new users are a decreasingly material source of minicomputer industry growth, a sign of the industry's maturation. The slowdown is evident in all segments of the in-

FIG. 6

WESTERN ELECTRIC 3B20S GAINS MARKET SHARE

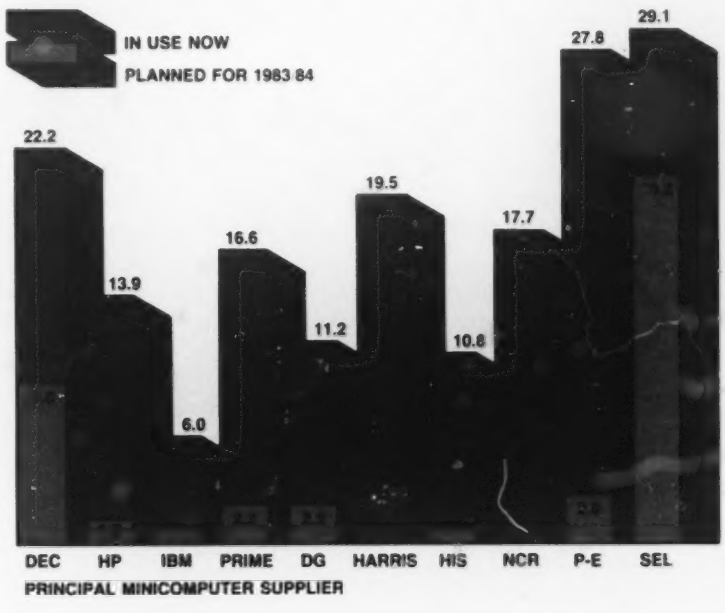


*9.2% Tandem systems

Western Electric itself a sizable user of 3B20S systems, but counted in Electrical Machinery SIC rather than in Communication SIC.

FIG. 7

SIGNIFICANT GAINS AHEAD FOR UNIX



Western Electric 3B20S population 100% Unix based

dustry measured: small business systems, traditional minis, intelligent terminals, data entry systems, and office systems.

Moreover, a trend observed in recent years of users consolidating their purchasing activities to a small number of current suppliers was further evident in this year's data. In all categories of the minicomputer market, respondents indicated that they are increasingly considering only one vendor, their current one, in buying new minis. For instance, among those buying traditional minis, 41% of those responding looked at only one vendor.

With few exceptions, Digital Equipment was the most frequently cited close competitor in multi-vendor procurements. Fully a half of those eventually choosing Data General hardware, for instance, also looked at DEC hardware. Even among IBM buyers, 24.1% considered DEC equipment.

The highest incidence of noncompetitive, one-supplier procurements went to Western Electric, DEC, and IBM. (Western Electric was counted in the survey for the first time this year, its 3B20s and 3B5 machines all showing up at AT&T sites.) In multiple supplier procurements, DEC and IBM were winners more often than not, followed by Hewlett-Packard.

Among the traditional minicomputer suppliers, HP was found to capture much more of its users' peripherals add-on business than Data General or DEC. Almost 83% of HP respondents chose HP peripherals, compared to only 58.7% for Data General and 58.1% for DEC. IBM respondents ranked in at 72.2%. Overall, however, the survey showed a continuing yearly trend of less peripherals business going to systems suppliers: this year only 61.4% of such business went to primary systems suppliers, while the comparable figure for 1981 was 73.8%.

The strongest small-systems peripherals shipment growth this year, as last year, was indicated for low-end rigid disk drives (up 219.1% over the previous 12 months) and color graphics terminals (up 131.1%). Add-on memory, serial printers, and monochrome terminals also showed strong growth.

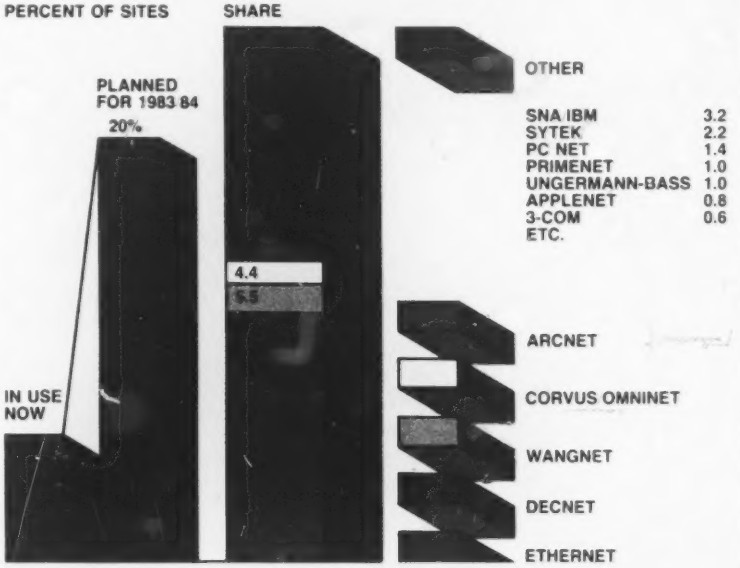
The growth in small rigid disk drives—less than 15 megabytes—was attributed primarily to the IBM XT personal computers. Fully 53% of those respondents indicating they were purchasing a personal computer of some sort said they would also buy a small hard disk. Meanwhile, 83% of those users were shopping for a printer, 79% for a monitor, and 82% for a floppy disk. Epson and DEC led the way in share of serial printer purchases for the coming 18 months, while IBM and DEC were tops in crt terminals.

Disk storage on minicomputers rose a small amount this year, to an average of 275 megabytes, which works out to a better

FIG. 8

LOCAL NETWORK IMPLEMENTATIONS TO TRIPLE

Query: Any plans to install a non-phone local area network (such as Ethernet)?

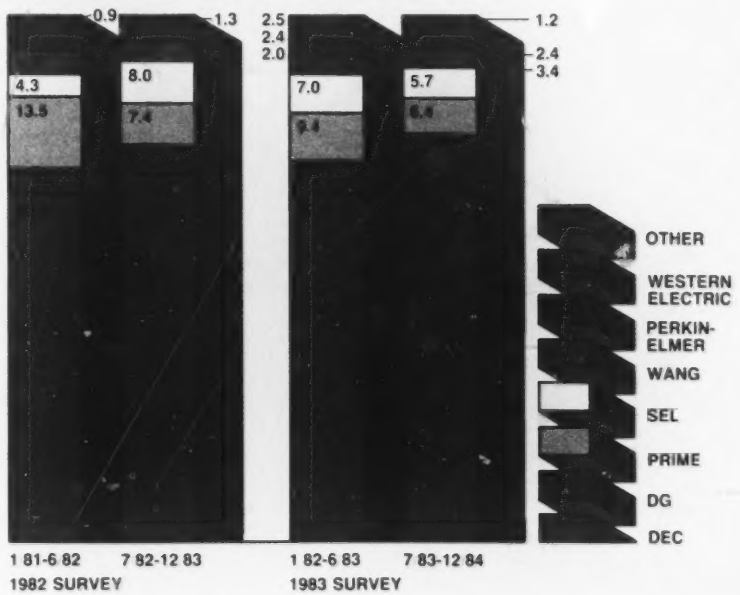


A minority of respondents still indicate some confusion regarding the definition of local area network. Ethernet by far most frequently cited.

FIG. 9

LEVELING OFF IN DEC SHARE OF 32-BIT SYSTEMS MARKET

PERCENT OF RESPONDENT 32-BIT SYSTEMS PURCHASES



*4.8% from a single site large end user purchase

than 30% five-year compound growth. Tandem users indicated the largest disk usage—an average of 689MB per system.

Add-on memory showed a 50% five-year compound growth rate, amounting to an average size of 950 kilobytes per system this year. Last year's number was 551 kilobytes.

However, the rise in microprocessor-based memories is rising even faster, at 63% for a three-year compound rate compared to a similarly measured rate of 44% for minicomputers. The average desktop machine now has 186 kilobytes attached.

Turning to the outlook for minicomputer purchases, the survey found an unambiguous upturn for the positive. For instance, after three years of falling, the number of oem/systems house respondents claiming their on-hand inventories were "too low" took a jump from 8% to 11%. Apparently, those resellers in the business and commercial market had a lower supply of machines than those involved in technical applications. The implication, of course, is that oem/systems houses soon expect to purchase machines, because they perceive business coming their way.

Another measure of the positive outlook came from a decided drop in the number of end-user and reseller sites admitting they had delayed or cancelled orders for minicomputers previously scheduled for delivery in 1983. According to Cowen analysts, the number of sites indicating such rescheduling of orders dropped to prerecession levels.

Even more encouraging for vendors was the relatively stable minicomputer pricing foreseen in the coming year among oems and systems houses. This came after a year of "soft pricing" in which vendors—particularly Prime Computer and Texas Instruments—slashed prices to increase sales.

The respondents' planned minicomputer purchases through 1984 show IBM garnering a 16.4% share of total spending compared to DEC's 36.1%. HP and Data General follow with 8.3% and 8.2%.

Overall minicomputer shipments will increase in dollar terms by about 14%, without taking into account revenues from service, terminals, personal computers, and other equipment sold by minicomputer makers, according to the survey. While this growth rate is better than the 12.5% projected in a similar survey last year, it is nowhere near the 117% growth foreseen for personal computer shipments. These two figures combined work out to a total minicomputer/personal computer industry increase of about 30%.

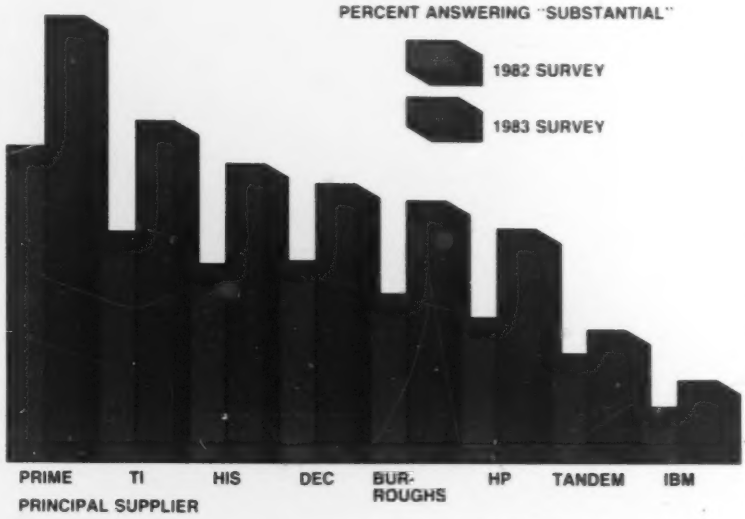
The weakest growth is foreseen in the traditional minicomputer market, which has been most affected by the personal computer. Small business systems shipments will rise, on the other hand, as will data entry and office systems.

Some additional observations:

FIG. 10

MINICOMPUTER PRICE DISCOUNTS ON THE UPSWING

Query: How big a price concession (above and beyond any normal quantity discount) did you receive when acquiring your last minicomputer system(s)?



Survey shows relatively stable pricing behavior for Wang, Data General, and Perkin-Elmer relative to year earlier.

• Interest in nonstop computer systems was even higher in this year's survey than in last year's. Superminicomputer sites were most interested, but the concern with remaining compatible with current systems was quite pronounced. This may mean that newcomers to the fault-tolerant market pioneered by Tandem Computers will have a rough time convincing buyers to install machines built with obscure architectures.

• The 32-bit segment of the minicomputer market is by far the strongest, showing an expected 46.2% share of respondents' total minicomputer purchases planned for the 18 months following the survey date.

• DEC's two-thirds share of the 32-bit market is leveling off among survey respondents, while Data General appears to be gaining share. Prime slipped a few points. DEC, it would appear, will soon have to replace the now six-year-old VAX-11/780 as the top end of its 32-bit line.

• Data General has enjoyed a strong reception for its high-end MV/10000 machine. Respondents indicated that 41.5% of the dollars they spend on DG's 32-bit machines will be for the model 10000.

• Western Electric is soon to become a contender in the minicomputer market, through its Unix operating system and its line of 32-bit minicomputer systems. Among respondents in the communications industry, 16.7% of minicomputer shipments will be the WE hardware. Unix usage is currently found primarily in DEC sites, but the highest rate of new use is expected to come from HP and IBM sites.

• DEC and IBM are doing particularly well in the distributed processing arena, accounting for about 50% of current ddp use and just over 60% of planned use. In contrast, Datapoint's share is showing a dramatic decline.

To summarize:

• The emergence of the IBM personal computer as an industry standard has ominous implications for differentiated suppliers. However, it is still incumbent upon traditional systems suppliers to participate in the personal computing segment, as well as in the relatively healthy high end of the minicomputer market to protect against competitive incursions and for growth.

• Peripherals, packaged software, and integrated circuit vendors are seemingly the beneficiaries of the overall growth trend, regardless of the competitive outcome on the systems side.

• The minicomputer industry may only be experiencing a cyclical upswing, and its future strength may be seriously weakened by incursions by the personal computer and other micro-based systems.

To order copies of the full DATAMATION/Cowen survey, call Debbie Mitchell at (212) 605-9722. The price is $795.

When end users take the personal computing plunge, dp managers find the water more roiled than ever. But it says here they expect to make things work swimmingly.

MICROS AT BIG FIRMS: A SURVEY

by Data Decisions

Corporate employees, as everyone knows, have embraced personal computing with a passion, and the trend is expected to accelerate. But for the corporations, and especially for their dp departments, the little machines still seem to raise more questions than they answer. What, exactly, are micros accomplishing today? What might they accomplish tomorrow, and how will organizations get there from here? And what role do dp managers expect to play as their companies make fundamental changes in the way they handle information?

For answers to these and other questions, Data Decisions recently surveyed dp managers at a thousand corporate and institutional installations. The results overturn some perceptions on the use of personal computers in big companies and on the attitudes of the professionals who dictate their use.

The installations surveyed represent a cross section of American business; the top three categories were manufacturing, financial/insurance, and transportation/utility. The average number of employees at these sites was over 1,900, and all own or lease computer equipment with equivalent monthly dp rental charges in excess of $50,000. (For more detail on how the survey was conducted, see box, p. 174)

The questions were designed to find out how and where personal computers are being used in large installations and to explore the attitude of the dp manager toward their use. The survey went out to dp managers at 2,000 organizations. Over 50% responded, often with lengthy comments and other indications that this is indeed a critical topic. The respondents were opinionated and interested. They were also knowledgeable; even for the most difficult questions concerning current usage patterns, over 80% of the participants responded. Their answers provide some startling insights into what is important in the corporate use of PCs.

The attitude of the data processing organization has a major influence on the use of personal computers in large corporations. While there is some indication from their comments that certain dp managers are merely accepting the inevitable, in most cases the attitude is overwhelmingly positive. A solid 59% of the dp managers reported that they were favorably disposed to the use of personal computers by non-dp personnel. An additional 34% were "somewhat favorable"; 4% were somewhat unfavorably disposed, and only 2% had strong objections. This favorable attitude is fortunate since 82% of the managers reported some personal computers in use at their locations.

Participants were asked to disregard their own attitudes and list what they saw as the advantages and disadvantages of PC use. The most significant benefit, cited by 44% of the respondents, was improved management or professional productivity. One way dp managers expect micros to address this problem is by taking over a "backlog of small but useful applications needs that cannot be addressed by data processing professionals, because the volume of applications is too great." Another manager felt that the micro's chief value lay in its "ability to be interactive and experiment" in cases where the user can't define the exact boundaries of the job. Computer literacy was also cited as an avenue through which productivity could be improved, underscoring the almost universal attitude of dp managers that computers will play a vital role in all aspects of corporate operation in the years ahead. "The personal computer will familiarize users with computer concepts," suggested a dp manager who strongly supports using personal computers.

Some comments on computer literacy suggested that dp managers were not altogether sorry to see users experience the problems that come with computers. One respondent noted that "users would get more

ILLUSTRATION BY ANDREA BARUFFI

Data security and control of sensitive information ranked as the top problem anticipated by dp managers.

familiar with data processing problems, frustrations, capabilities, etc., which in itself will help to promote better feelings and better understanding of data processing." Programming was an area of particular sensitivity. Working out their own applications, according to one manager, "makes users aware that all applications are not simple."

A second major benefit is felt to be a reduction in the dp workload, both from a programming and an operations perspective. Twenty-nine percent of the dp managers felt that the growth of personal computer usage would reduce the workload of the dp department. However, they had few concrete examples of exactly how this reduction would take place. One manager reported that "certain editing tasks now performed on the mainframe" could be offloaded, suggesting that personal computers might serve as local transaction editors.

FIG. 1

ROLE OF DP DEPARTMENT IN PURCHASE BY USER DEPARTMENTS (%)

ROLE	CURRENT[1]	EXPECTED IN ONE YEAR[1]	IDEAL[2]
Mandate which system to buy	18	19	20
Participate in decision	48	57	70
No official voice but promote dp department as source of information/advice	16	11	8
No official voice; offer information/advice only when asked	9	3	1
No role	3	1	*
No answer	6	9	1

[1]Base: other departments are using PCs.
[2]Base: all respondents
*Less than 0.5%

CONCRETE IDEAS ON COST CUTS

In the area of programming services, the ideas on how costs might be reduced were more concrete. One manager expected micros to "assist with development of those applications that don't require access to mainframe data—sales forecasts, budgets, and maybe some modeling." Where dp development resources are significantly overextended, dp managers suggested that personal computers could help by absorbing most local applications.

Dp managers are also conscious of the advantages of personal systems for ad hoc applications. "They are easy to use where there are limited amounts of data involved," one manager reports, "so the results usually come quicker." In all, 28% of the managers saw quick access to needed information as a potential benefit. Having their own systems will give users "quicker, more personalized results." The use of spreadsheet packages to answer "what if" questions was a frequent favorite application.

The favorable attitude toward personal computers is mirrored by a general expectation that their use will ease the burdens of the dp manager in the long term. Fifty-nine percent of those surveyed felt this to be true, the same percentage that favored the use of personal computers in their corporations. An almost equal number, 60%, however, felt that their jobs would be made more difficult in the short term, primarily because of user unfamiliarity with the program and data controls that form the core of most dp department procedures.

Data security and control of sensitive information ranked as the top problem anticipated by the dp managers, with 40% expecting difficulties in these areas. "It's a security risk," one said bluntly. "Failure to audit their data or test their results will result in bad numbers," predicted another manager who expected short-term problems. A third manager, who reported being only "somewhat favorable" to personal computer use in the company and who expected this use to complicate the dp manager's job even in the long term, suggested that "their use will cause a serious loss of control over a valuable corporate asset—data."

Inconsistency of data and of the reports produced from it worries 19% of the respondents. "Confusion due to duplicate data is going to be a problem," one manager explained. The reason for this confusion? Lack of organized dataflow and audit trails. "PCs can lead to mass managerial confusion, because no one knows where the numbers came from." Dp managers also fear a certain amount of "number merchandising." As one put it, "We're going to see a proliferation of different interpretations of the same data."

Waste and cost issues were the third major area of concern, with 18% of those surveyed believing that the user was likely to waste money on the wrong purchase or misuse the equipment once it was installed. "Users tend to say 'just make it work' without a commitment to learn and understand—they want to be button pushers versus data processors," went one comment. The lack of data processing savvy is expected to result in a simplistic approach to the systems: "they'll use the device as an expensive adding machine," or "it will become a toy rather than a tool."

Related to the issue of waste is the issue of duplication of effort. Review committees to evaluate and approve individual departmental applications were not much in evidence, and once equipment was in place, this lack was felt to lead to redundant development. "The disadvantage is that everyone will try to do their own programming instead of performing the jobs they were hired to do. Duplication of effort will result," said one respondent, and 17% of the managers agreed.

BUYING: A DELICATE BALANCE

The purchase of a personal computer in a large corporation can reflect a delicate balance of influences. Users may feel that the dp organization wants to retain control over all corporate computer resources and resent dp input into what they see as a local purchase decision. Corporate management, concerned about the possibility of purchasing inferior or unsatisfactory equipment, may encourage users to seek professional advice from the internal data processing staff. "The capabilities of personal computers are oversold by the media," explained one manager.

Most managers are aware of both the responsibility to advise the user and of the natural resistance to having purchase policy dictated. While 70% of those surveyed felt that dp managers should "participate in the decision along with the manager of the acquiring department," only 20% felt that the manager should mandate which systems could be acquired. Only 9% felt that their role in the decision process was unnecessary; 8% believed that an active effort to promote the dp department as a voluntary contact point was required, and 1% felt that the dp organization should offer advice or information only if asked (see Fig. 1).

Results were less rosy when the "ideal" was compared with the current role and the role expected within one year. Progress toward the ultimate goal of participation

Interaction between PCs and mainframes or minis is clearly regarded as the wave of the future.

can be measured by a shift in role from the unofficial "influence," which conjures up images of meetings in cafeterias and smoke-filled rooms, to a formal joint responsibility. Within one year, three out of four managers expect to take an active role, but currently nearly one in ten limits involvement merely to answering questions if asked.

Where the dp manager has input to the decision process, that input usually takes the form of guidelines. Seventy-three percent of those surveyed provide a list of recommended makes/models, and the same percentage offer selection guidelines for users. Slightly over half (56%) offer guidance on the languages the systems should support. This response is significant because it may constitute acceptance of a user programming role by a majority of dp managers and, perhaps, contradict the assumption that end users are to be relegated to packaged programs such as word processors and spreadsheets.

What factors do the dp managers consider most important in the selection of micros? Fig. 2 shows what proportion of the dp managers rated each factor very important and what the average score was for each.

Analysis of the responses suggests that dp managers' primary concern is that the system selected be suited to the initial application. Software support for it (the most important factor) and ease of system use (the second) would combine to provide the user with an easy transition. The next level of concern involves expansion/upgrade capability for both hardware and software and the so-called "management issues"—compatibility (by only a slim margin of 54% to 44% the majority of managers feel that the result of a selection process will be a single vendor to serve all user needs), vendor reputation, service, and training. Cost and technical features, such as memory size and disk capacity, are considered the least important factors.

In summary, the dp manager's attitude toward the decision process is often refreshingly nontechnical. As one respondent put it, "Get them something they can use now so the system will cost-justify, be sure it can be adapted to other applications, then worry about traditional dp factors."

The actual role played by the dp manager seems to fall short of the goal of being a full participant in the purchase decision. Many managers were not even aware of which employees used personal computers at their installations. Only 25% felt they knew where all personal computers were being used; 33% could account for most of the systems, 21% for some. Three percent said there are PCs at their sites, but they don't know where or how they are being used; 8% were not sure whether systems were in use or not, and 13% were sure that none were.

FIG. 2

IMPORTANCE OF SELECTION FACTORS

SELECTION FACTOR	% RATING FACTOR AS VERY IMPORTANT	AVERAGE SCORE (1-5)
Available software packages for current applications	65	4.57
Ease of use	56	4.48
Compatibility with existing mainframe, mini, or micro computers	56	4.37
Availability of large number of software packages	53	4.35
Vendor reliability/reputation	48	4.30
Quality of service available	44	4.24
Expansion/upgrade capability	34	4.07
Quality of training available from vendor/seller	25	3.72
Compatibility with existing PC peripherals	23	3.66
Current use of same model by others in company	21	3.62
Cost of system	17	3.54
Ability to get service from another vendor already on site	13	3.14
Amount of processor memory	12	3.55
Mass storage available	12	3.43

FIG. 3

INFLUENCE IN DECIDING WHICH PCS ARE ACQUIRED BY NON-DP DEPARTMENTS (%)

DECISION MAKER	INFLUENCE: GREAT DEAL	FAIR AMOUNT	LITTLE OR NONE	NO ANSWER
Data processing department	47	29	17	7
Manager of the individual department	36	39	18	7
Individual user(s)	26	38	26	10
Central purchasing department	6	14	69	11

One reason for this lack of knowledge may be related to the issue of budget purchase authority. The dp department in a large organization is unlikely to be the direct source of funds for the purchase of personal computers. Forty-three percent of the managers at sites where other departments use personal computers say they are always paid for out of the user department's budget; another 24% indicate that this is usually the case.

Although this undoubtedly influences how much say the dp department has in the purchase of personal computers by user departments, when it does play an advisory role, its influence is appreciable. Fig. 3 shows how dp managers perceive their comparative influence.

The acceptance of dp input into the decision process is not the only place where reality trails expectations. Dp managers were asked to identify the areas where the dp organizations *should* provide user services, and

Although computers are moving into the executive suites, they are not moving out of the lab.

then those they service currently and those they expect to support within a year. The views shown in Fig. 4 indicate the role dp organizations feel they should play in the after-purchase support of personal computers and offer a glimpse of the dp manager's views on general policies in the use of PCs.

FALL SHORT OF GOALS

Dp managers fall short of their goals in all areas, but nowhere is the difference more dramatic than in central database support. Interaction between personal computers and the installation's mainframe or minicomputer is clearly regarded as the wave of the future, with nine out of 10 dp managers advocating that the department help PC users access central databases. Currently, however, only 44% of the managers at sites where non-dp departments use PCs claim they are able to provide this service. On the other hand, 74% expect to do so within a year.

The very high score given to the issues of central data access also reflects the dp managers' views on the future role of personal computers. A clear separation of functions is expected, with the PCs providing remote processing services against a centrally maintained and supplied database. A PC may thus replace an intelligent terminal, providing remote access but also offloading some processing functions.

This relationship is confirmed by the managers' perceptions of the effects of personal computer selections on the use of intelligent terminals. When asked how often they recommended personal computers in an application where an intelligent terminal would have been recommended two years ago, 21% reported having done so frequently and 41% occasionally. Only 28% rarely or never did so.

The replacement of intelligent terminals raises issues of protocols and compatibility at the connection level. Some dp managers felt that insufficient attention was paid to the problem, and they foresee a heavy penalty for this failure. "Incompatible equipment," reports one dp manager, "will stymie eventually tying everything together in a network." Another is more specific: "There's a real danger if you don't control the protocol used. We happen to be an SNA shop!"

Uncertainties about the role of the dp organization do not seem to be affecting the rate at which dp managers in large companies expect their use of personal computers to expand. When asked what trends in usage they anticipate, 72% of the respondents predicted internal dp department use would increase, while 88% thought other departments' use would rise.

The fact that dp managers are more likely to foresee growth in PC applications outside their own departments than within does not mean that PCs are considered unsuitable for the dp organization. When they were asked to provide a profile of the current use of personal computers within their corporations, 91% of the dp managers at installations where PCs are currently in use reported use by the dp department. This was the highest percentage of any corporate department.

Fig. 5 shows the extent to which personal computers have moved from use as specialist tools into the mainstream of the business. When the managers at sites using PCs were asked whether and how many personal computers were used in specified departments, the response demonstrated a significant growth in nontechnical areas. However, the numbers also show that though computers are moving into the executive suites they are not moving out of the lab.

If the use of personal computers can be classified by department, it can also be classified by the job level of users. One key question in the growth of personal computer use is the extent to which the systems are being applied directly to high-level decision support. Penetration of the higher management levels by PCs is, in part, a tribute to the effectiveness of recent software designed for management use. While clerical use of systems is by no means unknown, management support applications now dominate. Both

FIG. 4

USER SERVICES PROVIDED BY THE DP DEPARTMENT (%)

SERVICE AREA	SUPPORT NOW[1]	EXPECT TO SUPPORT YEAR FROM NOW[1]	SHOULD SUPPORT[2]
Training and consulting	63	69	88
Identifying application packages	59	61	69
Providing central data access	44	74	90
Bringing up new applications	30	39	40
Hardware maintenance	24	30	44
None of the above/no answer	22	16	3

[1]Base: other departments are using PCs
[2]Base: all respondents

FIG. 5

USE OF PCS IN SPECIFIC DEPARTMENTS

DEPARTMENT	% REPORTING PC USE	AVERAGE NUMBER IN USE
Data Processing	91	5
Accounting	67	4
Research	44	9
Marketing	36	3
Manufacturing	27	5
Personnel	26	3
Sales	21	7
All Other	46	8

FIG. 6

PC USE BY JOB LEVEL (%)

JOB LEVEL	DP DEPT.	NON-DP DEPTS.
Middle Management	63	67
Clerical	38	47
Upper Management	24	22
Professional, Other	21	20

Comparison of current usage with that expected within a year does not suggest a major shift in applications.

outside and within the dp organization, the PC is clearly a management tool.

Are the uses to which personal computers are put satisfying the expectations of the dp manager? The managers had expected PCs to improve productivity, reduce mainframe workload, and provide faster access to data. What specifically is being done with the systems, and what is expected within the next year?

As shown in Fig. 7, use of personal computers is expected to grow in all areas except the catchall undefined category. The most dramatic growth areas are all related to the substitution of personal computer power for mainframe power, and the highest growth rate is expected in the area of offloading small programs and related data from the main computer.

If this prediction is correlated with the fact that the majority of personal computer users are expected to be management personnel, it indicates an expected increase in the demand for management decision support applications. The fact that so much is expected of personal computers in the area of replacing programs currently run on mainframes may explain the willingness of dp managers to recommend which programming language should be selected by end users.

Word processing and graphics production, applicable to both management and clerical users, are also expected to show significant growth in both data processing departments and user areas. Replacement of outside timesharing services, while not impressive in total expectations, nevertheless shows a very high growth rate. Since this area represents a direct cash outflow to a corporation, it could provide cost justification to fund the further expansion of personal computer use. Comparison of current usage with that expected within a year does not suggest major shifts in applications; the attitude is "the same things, but more of them."

FIG. 7

CURRENT VS. ANTICIPATED USE (%)

	USES OF PERSONAL COMPUTERS			
	DP		NON-DP	
FUNCTIONS	NOW	IN ONE YEAR	NOW	IN ONE YEAR
New applications not suitable for mainframe	41	54	73	82
Word processing	39	53	55	71
Production of graphics	26	48	36	65
Offload current applications	24	54	30	69
New applications that would have gone on mainframe	22	36	51	63
Bring outside timesharing under in-house control	5	16	21	33
Other	17	15	14	13

FIG. 8

PC BRANDS IN USE: PRINCIPAL MENTIONS (%)

	FREQUENCY REPORTED	
MANUFACTURER	WITHIN DP DEPT.	IN OTHER DEPTS.
IBM	55	57
Apple	25	46
Radio Shack	10	23
Digital Equip. (DEC)	4	10
Hewlett-Packard	5	9
Commodore	2	7
Osborne	4	6
Wang	3	5
Texas Instruments	2	4
Xerox	2	3
Victor	1	3
Altos	1	2
Heath/Zenith	1	2

PROBLEMS CREATING STANDARDS

The expected rapid growth in PC use has many dp managers worried about standardization. "There is a potential lack of equipment standards," one manager suggested. "We'll have a proliferation of micro vendors in a company and dp will have to support them all," explained another. However, while a bare majority (54%) of the respondents thought their companies should standardize on a single make of personal computer, a substantial (44%) want to acquire more than one make in order to take advantage of different vendors' strengths.

Competition among vendors has been intense, especially since the introduction of the IBM Personal Computer. A survey of the dp managers on the equipment currently in place both within the dp organization and in other departments provided not only an indication of brand preference among the very large corporations, but also showed the extent to which standardization is currently in effect (see Fig. 8). Non-dp departments are clearly less committed to a single vendor. While the IBM P.C. is used by more than twice as many dp departments as any other brand, it has a much narrower lead among non-dp departments. Dp departments were also less likely to experiment with new systems. The DEC computer was more than twice as common in non-dp departments.

It is difficult to interpret these differences. If the non-dp use of micros represents an earlier trend in purchase, when little control was exercised, the diversity could be construed as the result of uncoordinated purchasing.

Another possible reason for the number of vendors is the failure to integrate personal computers with other systems. In the average dp department using PCs, 58% of the machines are used only as standalone systems; in other departments the number is even higher—79%. These high percentages

There has been a dramatic increase in the use of personal computers in large corporations, the survey shows.

almost belie the fact that a full 90% of the dp managers rated providing access to centralized data as an objective of their organization. Perhaps providing central data access is a philosophical goal rather than a practical one; only 7% of the dp managers felt that providing users with assistance in networking or communication was a reasonable goal for the dp organization.

The survey of large corporations clearly shows a dramatic increase in the use of personal computers and indicates that the major beneficiaries of the systems will be management and professional personnel. The expected surge is already being watched by the software suppliers, and the sudden increase in all-purpose executive packages that combine word processing, database, spreadsheet, and other applications is one result.

The effects of the growth in corporate America's personal computer use are overwhelmingly perceived to be positive—increasing productivity and providing users with faster access to results. But in the short term, major problems in employing these little powerhouses may occur. Some are a natural result of a sudden increase in the perceived benefits of the systems, spurring an explosion in purchasing without providing time to establish a framework for their selection and acquisition. One dp manager ruefully compared the task of guiding personal computer selection to that of "directing an avalanche."

Some of the frustrations felt by dp managers are reflected in their comments and in the majority view that personal computers in the hands of end users will make their jobs more difficult in the short term. Many dp managers view the user community as lacking in computer knowledge (probably true), somewhat hostile toward the dp organization (almost certainly true), and therefore inclined to go it alone, given the chance. This latter fear seems groundless in the large businesses—there is simply too much at stake and everyone realizes it. While one dp manager is concerned lest the "hotshots attempt to make micros do what we are doing well on a larger system," the majority seem to realize that the user managers have no time to become a dp department, even if they had the inclination.

Unfortunately, lack of familiarity with even the most fundamental concepts of data processing can be as damaging to the decision process as deliberate obstruction of corporate data processing policy. This fact makes the centralized control of PC purchases vital if a cohesive, cost-effective corporate information policy is to have any hope of long-term success. While administrative controls may be a partial answer to the immediate problem, the dp managers seem to agree that the best answer is strong dp support for a rational policy of selection and use.

METHODOLOGY

The object of this survey, which was designed by Data Decisions and conducted by Beta Research Corporation, Syosset, N.Y., was to collect information on the use of personal computers in an institutional or corporate environment.

The universe for the survey consists of installations that have purchased or leased computer equipment with equivalent monthly rental fees that exceed $50,000. These installations were identified using the database maintained by Computer Intelligence Corp., La Jolla, Calif., a sister company of Data Decisions. At the time the sample was drawn, the universe consisted of 3,226 sites (7% of all U.S. sites in the entire Computer Intelligence database).

A random sample of 2,000 sites was selected on an nth name basis. On April 22, 1983, questionnaires were mailed to the data processing manager or MIS director at each site. A $1 incentive and postage-paid return envelope were included in the mailing. On May 18, a follow-up mailing was made to all nonrespondents. A total of 898 mail returns were received. During the weeks of June 20 and June 27, 1983, telephone interviews were conducted with 103 nonrespondents, bringing the total number of responses to 1,001, for an overall response rate of 50%.

The organizations surveyed represent a good cross section of U.S. dp sites:

Manufacturing	25%
Financial/insurance	18
Transportation/util.	8
Retail/wholesale	7
State/local govt.	7
College/universities	6
Non-mfg. business	4
Communication	3
Federal govt.	3
Medical	3
School district	2
Professional	1
Other	13

CENTRAL CONTROL OF DATA

It appears that the greatest challenge faced by the dp organization, and therefore by the large corporation, is the provision of central data access through mainframe-microcomputer networks. Lack of central control and inconsistent data were rated as serious problems, and 90% of all dp managers felt that central data maintenance and supply should be a key part of the dp department support policy for small computers. Yet, according to these same managers, standalone systems outnumber networked systems by over two to one, a wide margin.

Will the manager of the future use personal computers to digest and display the kinds of high-level information required for supporting major corporate decisions, or will that manager become more and more isolated by a mass of unconfirmed and uncorrelated data? As one dp manager put it, "How many different monthly sales figures can possibly be correct? Only one, obviously. But that's not how many we are going to have."

The personal computer revolution, like other computer revolutions before it, will be assimilated into the back office as well as the boardroom. By providing offerings in the microcomputer area, large system vendors such as IBM and DEC tend to tie together the user's information-management components. The success of the "you got the big one from me, now get the small one from me" strategy is obvious in the growth of the IBM P.C. from its introduction in 1981 to an estimated annual production of 600,000 units only two years later. That success is already changing the attitudes of other vendors, and even software companies are hurrying to provide offerings that integrate mainframes and micros into a package so tight it is difficult for the user to know where the information is and which system is handling it. If today's average non-dp user in a major corporation is uncertain about the alternatives, the trend toward product integration in the market is so well publicized that it will be hard for such a person to remain so.

The dp manager, for all the suspicions about the attitude and level of expertise of the user, is a professional at information management and is prepared to admit that the small computer has a large place in the corporation. As one manager put it, "Because of the complexity of our 'groups' of programmers, our standards, our procedural red tape, small jobs sometimes become bogged down. Faster turnaround could be helpful to many departments and to the company as a whole." With luck in the short term and with the proper planning and strategic foundations for the future, the personal computer seems assured of a major place in America's biggest businesses. ❖

Data Decisions is a research and consulting firm that publishes regularly updated information services on computer systems, communication systems, and software. It also provides custom research studies and on-line access to information on the full spectrum of information processing products and services. For specific information, contact Data Decisions, 20 Brace Road, Cherry Hill, NJ 08540; (609) 429-7100.

More than 100 computer-oriented companies have gone public in the last year, and there're more to come.

AN EXCESS OF MONEY

by Larry Marion

"Those guys were more interested in shipping product than in fixing its problems," grumbles the president of a small manufacturing company in Southern California. He bought an office automation system from a company that went public earlier this year, before its software was ready. "We finally went to them and asked for the Unix utilities, so that we could fix the problem ourselves," says the disgusted customer.

Many dp managers have faced a similar problem, or have at least muttered a few oaths about the new desktop system bought from a startup company anxious to bolster revenues to raise money on Wall Street. For the dp managers besieged by salesmen selling yet another 16-bit microcomputer, there's bad news on the horizon: the proliferation of computers is likely to get worse over the next two years, because the public is eager to buy stock in computer companies, even those that are relatively unproven. "A lot of companies are getting funded which shouldn't, due to an excess of money," says venture capitalist Benjamin Rosen, who raised $85 million to invest in new companies.

In the past 12 months through early September, 115 computer companies succeeded in selling stock to the public, according to a search of Securities and Exchange Commission files by Securities Data Co., New York. The underwriters of the computer stock offerings collectively pulled in roughly $2.4 billion from investors or their own accounts; dozens of other computer companies went public without an underwriter making a firm commitment to sell the shares. The record-breaking number of new computer stocks was part of the stock market craze for high technology—about one quarter of the "firm offer" initial public sales of stock over the past year were for computer companies, according to Securities Data.

The average new computer company had $19.5 million in revenues in the 12 months prior to the public offering. It showed $2 million in net income and sold about $21 million in stock. However, there was a wide range of operating histories, because companies that went public earlier in the bull market cycle were older and more established. For example, the largest computer company to go public, TeleVideo Systems, received $113 million from its offering, and had almost $100 million in revenues in the year prior to the March offering. It's been in business for six years.

Newer companies did not have wonderful profits to brag about, only the potential for earnings. Of the 115 companies to go public, less than half had decent profits—52 were solidly in the black, 39 broke even or had small losses, and 29 had substantial losses, according to Securities Data.

Many of the new companies with only red ink on their books took advantage of the seemingly insatiable appetite for new computer company stocks, many market observers say. "After the stock market run-up in prices and premiums, computer company owners couldn't afford not to go public," opines Terence Quinn, an analyst who specializes in emerging growth companies for Dean Witter Reynolds, the brokerage subsidiary of Sears, Roebuck. "In the first six months of the rally, companies with five years of experience went public. Now, the companies going public did not intend to go public this early, but did so just because they can get rich quick."

SKY-HIGH PRICES PAID

Indeed, some of the prices paid by the public are astounding. The average P/E, the traditional measure of value, was 58 for these companies. In other words, the price per share was 58 times the earnings for the preceding year. By comparison, the average multiple for all public companies is about 13, and 15 to 27 for large computer companies like IBM or Wang Laboratories. By another measure of stock price value—the premium paid over the per share tangible assets of the company—the prices were even more outrageous: while most high-tech stock sells for a "book" value multiple of six or less, the average premium for the new computer firms was 30. "The companies offering stock for high multiples are displaying considerable chutzpah," notes Frederic Withington, vice president at Arthur D. Little, Cambridge, Mass.

The $2.4 billion in cash raised by the new companies will find its way into product designs to be introduced over the next few years, further complicating the choices to be made by dp managers. The explosion in microcomputer products on the market, 361 by one recent count, is nothing compared to what some see on the horizon.

The number of new desktop computer design proposals won by Intel and its 16-bit microprocessor chips is mind boggling. Currently there are between 600 and 700 companies buying the two 16-bit cpus, the 8086 and the 8088. "We are shipping several hundred thousand 8088s per month," claims Andy Verhalen, product manager at Intel. Half of the 8086 and 8088 designs, but most of the production volume, is for personal computers, he says. Company officials concede that there are "production shortfalls" of the key chips, but claim production is being stepped up dramatically.

The next generation of 16-bit microchips, the 25% faster 186 and 188, are being designed into new products at the rate of more than one a day, according to Tony Barre, Intel marketing manager. "We already have 400 product designs locked up and we expect to have 1,000 by the end of the year," he says. About half of the designs are for workstations, the other half for intelligent controllers. Convergent Technology's Megaframe controller and n-gen workstation are two of the hundreds ready to appear on the market. Intel says that its production of the new chips will exceed that of the current generation by 1985, indicating that dp managers will have about a year to digest the 8086 and 8088 boxes before the 500 or so of the next generation are introduced.

The odds for the survival of these companies and their products are subject to debate. Rosen insists that "there is room for this type of activity as long as there are no standards in the marketplace." With market demand growing at 30% to 40% per year, he

Software companies often go public in order to build an acquisition war chest.

FIG. 1

TEN LARGEST COMPUTER COMPANIES TO GO PUBLIC IN LAST 12 MONTHS

DATE	NAME OF COMPANY	TOTAL AMT ($MIL)	REVENUE LATEST 12 MOS ($MIL)	NET INCOME ($MIL)	P/E	PREM OVER BOOK	COMPANY DESCRIPTION
3/15/83	**Televideo Systems**	113.	98.5	12.7	50.0	26.44	mfg video display terminals
3/4/83	**Fortune Systems**	110.	26.0	–3.2	—	27.86	mfg/mkt desktop computer
3/3/83	**Apollo Computer**	88.0	18.1	0.3	1,100.0	32.70	mfg/mkt/service computers
4/27/83	**Telerate**	80.0	51.9	14.5	54.1	66.19	oper computer financial syst
3/23/83	**Victor Technologies**	78.8	123.4	–11.3	—	10.85	mfg/mkt microcomputer
6/30/83	**Wicat Systems**	72.0	25.3	–4.1	—	63.05	mfg/mkt microcomputer syst
11/4/82	**Altos Computer** Systems	69.3	57.4	6.4	38.2	16.53	dvlp/mkt microcomputer syst
6/2/83	**Priam**	65.5	51.2	1.2	170.0	18.10	mfg/mkt disk drives
5/27/83	**Norsk Data**	56.6	85.6	7.1	41.9	4.07	mfg/mkt minicomputers
12/10/82	**Quantum**	51.3	29.8	4.1	20.1	10.90	mfg/mkt disk drives

SOURCE: SECURITIES DATA

FIG. 2

TEN MOST EXPENSIVE NEW COMPUTER COMPANY STOCKS

ISSUE DATE	NAME OF CO.	TOTAL AMT. ($MIL)	$PRICE/ SHR	NET INC ($MIL)	PRICE/ ERNGS
3/3/83	**Apollo Computer**	88.0	22.00	0.3	1,100.0
6/1/83	**Daisy Systems**	31.0	15.50	0.4	221.4
6/3/83	**Micropolis**	40.2	17.00	0.7	170.0
6/2/83	**Priam**	65.5	17.00	1.2	170.0
6/30/83	**Avant-Garde Computing**	30.1	16.00	0.3	123.1
8/26/83	**Stratus Computer**	36.0	12.00	0.9	100.0
3/25/83	**Masstor Systems**	48.0	16.00	1.3	100.0
6/24/83	**Margaux Controls**	24.8	16.50	0.7	97.1
7/12/83	**Micro D**	32.0	16.00	0.8	88.9
7/12/83	**Perfectdata**	9.2	8.50	0.2	77.3

SOURCE: SECURITIES DATA

adds, there will be enough customers for awhile.

Others take a less sanguine view. "In five years 20% of these new companies will be operating in some independent form," estimates Withington of ADL. "Another 20% will have gone bust, and the rest will get a little bigger and then sell out to a bigger company that is trying to diversify." Another venture capitalist estimates that one out of 20 new companies will survive. A study by the SEC after the 1960 to 1961 boom in new companies found that three years later, only 20% remained profitable.

The $64,000 question, of course, is, Which ones will survive? "The marketplace is a quagmire, with an overabundance of new entrants," observes Stephen McClellan, vice president of Salomon Bros., a Wall Street investment banking and stock brokerage firm.

Certain market segments, though, are less crowded. The high-end workstation market, with price tags of $20,000 and up, is an area with relatively few players. Alexander Stein, senior industry analyst at Dataquest Inc., Cupertino, Calif., notes that Apollo, Perq Systems, Charles River, and several other companies in that market category will thrive if they can maintain strong ties with major systems vendors such as Calma, Applicon, and Computervision. "It's a small market, growing 25% to 30% per year from less than $1 billion today," says Stein. "That will level off and stabilize."

A more competitive marketplace, Stein notes, is what he calls the Unix box business. He counts 70 companies making microcomputers using the Motorola 68000 chip or other high-performance micros, and the Unix operating system. Fortune Systems is one of the companies that is fighting for market share, as the sector's annual growth rate has slowed to 25% from 45%. "These companies are starting to feel the competition," he says.

The crush of competition is heaviest in the "IBM emulation" market, with more than 100 personal computers that run Microsoft's MS/DOS or PC/DOS software. "The market is growing at a tremendous rate because

of IBM capacity limits," Stein notes. Over the next few years, he warns, IBM's production will expand rapidly and could significantly diminish the market for the P.C. clones. "Remember the early days of the VT100?" Stein asks. "Others came in when DEC had limited production, but after DEC went into volume, they got hurt. The uniqueness of some of the clones will keep them around, but the high growth rate will diminish and those that haven't diversified won't survive."

The shakeout in the portable computer category is already happening. Osborne Computer Corp. is bankrupt. "There are few barriers to entry in the portables business, with a short product cycle," notes Stein. "Osborne fell victim to the life cycle and cash flow perils—it couldn't get enough cash out of its current products, due to price competition, to keep new products coming."

COMPANIES REPORT TROUBLES

Other companies are reporting troubles as well. Victor Technologies, Vector Graphic, and Fortune Systems reported losses over the past few months. Other companies, such as Altos and Convergent Technologies, have warned that earnings over the next few months will be less than in the past, and nowhere near the levels investors expected when they paid the high premiums for the stock. Company officials insist that their firms will be healthy and will survive the inevitable shakeout.

Software companies that were no more than a gleam in someone's eye a few years ago are now part of a massive industry consolidation. New starts like On-Line Software and Hogan Systems are making joint venture agreements or buying other companies to broaden their product lines as fast as possible. "Many small software companies are using the money from the public offerings to buy other companies," notes Quinn of Dean Witter. "Essentially, they are using the stock offering cash to build war chests."

Picking the probable survivors is a tough chore, whether you are an analyst, venture capitalist, market researcher, or dp manager, but several rules of thumb are considered valid. "Any company that we put money into must have an aggressive new product policy," notes Rosen. "A new company typically needs to expand its product line in three to four years," explains Withington of ADL. "Of the 80% of the companies that won't make it, half will sell out due to the lack of an encore, a second big product."

A full line of me-too products is not a recipe for success, though. Proprietary technology is crucial, notes Quinn. McClellan points to Massior Systems as an example of a company with long-term prospects, owing to its proprietary technology in the relatively uncrowded market for large storage devices.

When a dp manager considers dealing with a new company, a checklist of what to look for should include a close scrutiny of its prospectus. Companies going public without a history of earnings should be avoided. Managers should also look for senior company officials with experience at big companies in a related field, and for big name venture capitalist backers.

The president of that small manufacturing company in Southern California said he was aware of those considerations before he bought the software-deficient office automation system. The vendor had promised to fix the problems with revised software, but the customer is still waiting. That particular vendor, like others, tried to use the public offering cash to cover over its mistakes of the past, alleges Stein. It couldn't.

EASY COME, EASY GO

The Kay family of Solana Beach, Calif., lost a quarter of a billion dollars over the summer. They didn't lose it in a Las Vegas poker marathon, but on Wall Street. In early July they offered to sell shares in their portable computer company, Kaypro, for up to $18 per share; therefore, their holdings of 28 million shares would have been worth $504 million. But after intense negotiations, pension fund managers and other investors refused to pay more than $10 per share. The value of the Kay family stock dropped to a mere $280 million on paper.

Instant riches are still possible on Wall Street, regardless of the losses suffered by Texas Instruments, Mattel, and the Atari division of Warner Communications. The ardor for new computer stocks has made millionaires out of many executives of computer systems firms and their peripheral companies.

Last year a limited partnership led by former Wall Street analyst Benjamin Rosen and Mostek founder L.J. Sevin invested about $2.3 million in Lotus Development Corp., the Cambridge, Mass., company that produced the 1-2-3 integrated software package for the IBM P.C. A few weeks ago the company went public, and the market value of the shares held by the Sevin-Rosen partnership was between $46 million and $53 million, or a 15-fold profit in little more than a year. The liquidation value of the partnership's portion of the company's assets was $1.7 million.

There are scores of overnight millionaire stories. Phil Hwang, founder of terminal and desktop computer maker TeleVideo Systems, owned 29 million shares of his company, each valued at $18, when it went public in March. On paper his holdings were worth $520 million.

Many longtime investment analysts and computer industry observers were shocked at the high per-share prices set for these companies. In many cases, the liquidation value of the company on a per-share basis was less than a dollar per share.

Lotus priced its shares at $13 each when the company's liquidation value was 48 cents per share as of June 30. TeleVideo's tangible book value was 68 cents per share when the price was set at $18. When Kaypro sold 4 million shares of stock at $10 apiece in August, the value of the company at that time was little more than 20 cents per share. In the past, investors were willing to pay a high premium in return for the higher earnings growth and stock market price potential of new high-technology companies. Unfortunately, as many wags note, the offering prices not only discount the future, but the hereafter as well.

The offering price for the stock of new companies is determined in a series of private negotiations between the Wall Street brokerage houses and their customers. The resulting price is a balance between supply and demand, though the relative valuations dropped during the summer after several high-tech stocks lost some of their glitter in the wake of the losses posted by TI, Atari, and others.

"The prices are lower now, because there's less euphoria in the marketplace and a lot of the stocks are selling below the offering price," explains Rosen. The number of deals is slowing down, he adds, because only the quality companies can attract premium prices. "The lower quality deals are in trouble."

One company that recently tried to go public but faltered was Androbot Inc., a manufacturer of several types of consumer robots. In June the company offered to sell stock for up to $12 per share, seeking an infusion of $1.5 million in new working capital. But the offer was withdrawn in September, explains a company official, "due to market considerations." One money manager avers that the company's poor financial health was more of a factor. "I was shocked to see this as a deal," he said, "and further shocked that Merrill Lynch would be associated with it." First-rank brokerage firms like Merrill Lynch usually take only the most successful companies as clients; Merrill Lynch officials declined to comment.

Technically, Androbot was bankrupt when it tried to sell stock. Although it had sold nearly 700 robots earlier this year, the company had less than $400,000 in assets compared to almost $3 million in liabilities as of March 31. Only loans from Nolan Bushnell, the founder of Atari and now the godfather of several Silicon Valley startups, including Androbot, keep the company above water; in fact, the company's San Jose office space lease is personally guaranteed by Bushnell. If Androbot's stock offering had succeeded at $12 per share, Bushnell's holdings would have been worth $37.7 million. He may have a long wait to see that money.

—L.M.

NOTE

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